REMARKS/ARGUMENTS

The above-identified patent application has been amended and reconsideration and re-examination are hereby requested.

The ABSTRACT has been amended.

The attached sheets of drawings include proposed changes to FIGS. 2, 3, and 4. The labeled "PRIOR ART" has been inserted. Approval is hereby requested.

Claims 1, 6, 11, 16, and 21 have been cancelled.

Claims 2, 4, 7, 12, 14, 17, and 22 point out that the lower channel layer has a bandgap greater than the bandgap of the upper channel layer. Sawada has just the opposite, i.e., the lower channel layer has a bandgap lower than the bandgap of the upper channel layer.

Claims 3, 8, 13, and 23 point out that the lower channel layer has a bulk electron mobility lower than the bulk electron mobility of the upper channel layer. Sawada has just the opposite, i.e., has a bulk electron mobility higher than the bulk electron mobility of the upper channel layer:

It is respectfully submitted that such an opposite relationship is therefore not obvious from Sawada.

More particularly, Applicants compare two devices in the patent application: One has a 0.53 In concentration in both the lower and upper channels and the other has an In concentration higher (0.53) in the upper layer than in the lower layer (0.43).

It is first noted that while reducing the Indium content in the subchannel of a dual channel device will improve the breakdown voltage and drain bias operation, such is at the expense of reducing its gain (H21) and current. This is a result of the reduction in bandgap with the lower indium content and the reduction in mobility, respectively. T<u>he inventors have discovered that a combination of channel that not only provides the improvement in breakdown voltage ***but also higher gain***.</u> Furthermore, this gain advantage is not only found at the lower drain biases (1.5V), but far more importantly, at the higher drain biases (2.5V) necessary to create power amplifiers.

More particularly, reference is made Figure 8 and 9 along with paragraphs [0057] and [0058] of the present patent application. As stated in such paragraphs:

> Hall measurements of the semiconductor layer structures of the 53% (FIG. 1) and 43/53% (i.e., device 10 in FIG. 4) MHEMTs show measured room-temperature Hall mobilities of 9624 and 9097cm^2/V□S respectively. FIGS. 8 and 9 show the small-signal frequency response of the 43/53% split-channel vs. that of the 53% MHEMTs. At 95GHz and Vds=2.5V, FIG. 8 shows both devices having a small-signal maximum available power gain (MAG) of 11.6dB. At 95GHz the 53% MHEMT has an H_{21} of 5.6dB while that of the 43/53% MHEMT is 6.2dB. At a V_{ds} of 2.5V and I_{ds} of 200mA/mm the current gain, H_{21}, of the 43/53% device is 0.6-0.8dB higher than that for the 53% device while MAG values are nearly identical for both devices from 10-100GHz.
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> FIG. 9 shows the effect of increasing V_{ds} on a comparison of the 43/53% vs. 53% devices. For a V_{ds} of 1.5V, H_{21} of the 43/53% MHEMT exceeds that of the 53% MHEMT by 0.65dB at 10GHz and 0.3dB at 100GHz. Here the MAG of the 43/53% device is ~0.05dB less than that of the 53% MHEMT. FIG. 9 shows the measured differences between maximum available gain (MAG) and current gain (H_{21}) of the invention compared against that of prior art and V_{ds} = 2.5V and 1.5V. For example the curve labeled "2.5V H_{21}" represents the H_{21} (in dB) of the invention minus the H_{21} of the prior art with both devices' H_{21} values measured at V_{ds} = 2.5V. Similarly, "1.5V MAG" is the invention device MAG minus that of the prior art device with both measured at V_{ds} = 1.5V.

It is respectfully submitted therefore, that Applicants' have discovered that there exists a combination of channels that not only provides improvement in breakdown voltage ***but also higher gain,*** i.e., that the structure have an $In_y Ga_{1-y}$ As lower channel layer and an $In_x Ga_{1-x}$ As upper channel layer disposed on the lower channel layer, where x, the concentration of the higher layer is higher (substantially 0.53) than y, the concentartion of the lower layer (substantially 0.43). Furthermore, this unique structure's (i.e., x=0.53 and y=0.43) gain advantage is not only found at the lower drain biases (1.5V), but far more importantly, at the higher drain biases (2.5V) necessary to create power amplifiers.

Thus, Applicants have also discovered that significant improvements are provided with a the structure having an $In_y\ Ga_{1-y}$ As lower channel layer and an $In_x\ Ga_{1-x}$ As upper channel layer disposed on the lower channel layer, *where x is substantially 0.53 and y is substantially 0.43.* These significant advantages (i.e., improvement in breakdown voltage ***and also higher gain***) provided by the *claimed* structure (i.e., *where x is substantially 0.53 and y is substantially 0.43*) are not recognized in Sawada (USP 5,650,642) or in the material presented in the Applicant's "Background of the Invention" section.

In summary then, it is Applicant's position that there is no motivation in Sawada (USP 5,650,642) or in the material presented in the Applicant's "Background of the Invention" section to provide a the structure having an $In_y\ Ga_{1-y}$ As lower channel layer and an $In_x\ Ga_{1-x}$ As upper channel layer disposed on the lower channel layer, the x is greater than y and specifically *where x is substantially 0.53 and y is substantially 0.43.*

In the event any additional fee is required, please charge such amount to Patent and Trademark Office Deposit Account No. 18-0550.

6-15-04
Date

Respectfully submitted,

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Attachments: Replacement sheets (3)